Chapter 4
Economics of Tobacco Consumption in the Americas

Preface

Although the economic aspects of smoking in North America have been extensively examined, detailed data are not available for Latin America and the Caribbean. For the latter region, a definitive analysis of the health costs of smoking and the economic configuration of the tobacco industry await more systematic reporting and collection of data.

In the first part of this chapter, a generic approach to assessing the costs associated with the major adverse health effects of smoking is outlined. The background for this approach, which uses concepts introduced in Chapter 3, is described. Data and examples from the United States and Canada are provided, and the work done in these countries is summarized.

In the second part, an overview of the tobacco sector of the economy is offered. Again, more data are available from North America than from Latin America and the Caribbean, but the economic issues (supply and demand, advertising, subsidies, taxation, and others) are relevant to all countries of the Americas. This overview provides a framework for weighing the relative costs and benefits of tobacco production and consumption.

Economic Costs of the Health Effects of Smoking

Latency of the Health Consequences

Since 1964, when a report on the health consequences of smoking was released by the Surgeon General's Advisory Committee on Smoking and Health (Public Health Service 1964), extensive research has assessed the disability, morbidity, and premature mortality attributable to tobacco use. The many effects of smoking on health were documented in the Surgeon General's twenty-fifth anniversary report on smoking and health (U.S. Department of Health and Human Services [USDHHS] 1989). A detailed examination of smoking-attributable mortality (SAM) in the United States summarizes these associations (Table 1). (See Chapter 3 for an assessment of SAM in Latin American and Caribbean countries.)

As an epidemiologic transition occurs in Latin America and the Caribbean, noncommunicable diseases are expected to become increasingly prominent as causes of death. For example, although Brazil bears a burden from certain infectious diseases (such as Chagas' disease) and the growing incidence of human immunodeficiency virus infection, many other infectious and parasitic diseases have been brought under control. Many cases of lung cancer are now anticipated in Brazil (The World Bank 1989a). Cardiovascular disease is the leading cause of death in Brazil (The World Bank 1989a), and the number of deaths due to cardiovascular disease is likely to increase significantly. Among Latin American women, for whom prevalence of smoking appears to have increased (see Chapter 3), an increased incidence of lung cancer may soon become apparent (Crofton 1990).

Numerous studies have reported a 20- to 30-year latent period between the initiation of smoking on a regular basis and the development of lung cancer (USDHHS 1982), a phenomenon well documented in North America. In the United States, many men started to smoke as adolescents or young adults around World War I, and many women started as adolescents or young adults during or after World War II. The incidence of lung cancer in the United States began to increase for men around 1940 and for women around 1960 (USDHHS 1989). A similar lag occurred in Canada; from 1976 to 1986, the rate of lung cancer doubled (Millar 1988). An epidemiologic and economic result of latency is the continued rise in lung cancer deaths despite a decline in the prevalence of smoking. In the United States, the lung cancer mortality rate for men did not begin to level off until 1985 (USDHHS 1989). For women, deaths from lung cancer have not yet peaked, and lung cancer has become the most common cause of cancer mortality, surpassing breast cancer (USDHHS 1989).

The correlation between the level of cigarette consumption in a population cohort when it enters adulthood and the lung cancer rate for that cohort when it enters middle age provides further evidence of the 20- to 30-year latency (Figure 1). In Brazil, lung cancer mortality among adult males has increased as a lagged response to the increase in tobacco consumption (Figure 2) that began during World War II. Thus, the consequences of tobacco consumption—including economic consequences—are long in developing, and the full impact of disease, disability, and death is measured over decades.

Estimating the Economic Costs

Many estimates have been made of the costs of smoking in the United States and Canada. A similar body of work is not available for Latin America and the Caribbean—in part because the data required for such analyses are often not available. In addition, a single estimate would probably not serve adequately because of the heterogeneity among countries of the region. An approach to estimating the health costs of smoking is described below, along with some estimates that have been made.

General Considerations and Limitations

Estimates of the economic effects of the health consequences of smoking generally consist of three components (U.S. Office of Technology Assessment [USOTA] 1985):

- An attempt to identify an increased incidence of smoking-related illness in current or former smokers and attribution of that increase to smoking.
- An application of these attribution ratios to estimates of the direct (health care) costs of caring for persons with smoking-related illness—to obtain an estimate of the direct costs of smoking.
- An estimate of the indirect costs of smoking-related illness, which is made by measuring the increased rate of morbidity and mortality in current and former smokers and then valuing (1) time lost due to morbidity by their current wage rate and (2) excess mortality by discounted future earnings.

Table 1. Relative risks* (RR) for death attributed to smoking and smoking-attributable mortality (SAM) for current and former smokers, by disease category and sex , United States, 1988

Disease category (ICD-9-CM)†	Men			Women			Total SAM
	RR			RR			
	Current smokers	Former smokers	SAM	Current smokers	Former smokers	SAM	
Adult diseases (≥35 years of age)							
Neoplasms							
Lip, oral cavity, pharynx (140–149)	27.5	8.8	4,942	5.6	2.9	1,460	6,402
Esophagus (150)	7.6	5.8	5,478	10.3	3.2	1,609	7,087
Pancreas (157)	2.1	1.1	2,775	2.3	1.8	3,345	6,120
Larynx (161)	10.5	5.2	2,401	17.8	11.9	589	2,990
Trachea, lung, bronchus (162)	22.4	9.4	78,932	11.9	4.7	33,053	111,985
Cervix uteri (180)	NA	NA	0	2.1	1.9	1,246	1,246
Urinary bladder (188)	2.9	1.9	2,951	2.6	1.9	963	3,914
Kidney, other urinary (189)	3.0	2.0	2,729	1.4	1.2	363	3,092
Cardiovascular diseases							
Hypertension (401–404)	1.9	1.3	3,441	1.7	1.2	2,254	5,695
Ischemic heart disease (410–414)							
Persons aged 35–64 years	2.8	1.8	29,263	3.0	1.4	9,105	38,368
Persons aged ≥65 years	1.6	1.3	41,821	1.6	1.3	27,990	69,811
Other heart diseases (390–398, 415–417, 420–429)	1.9	1.3	27,503	1.7	1.2	14,638	42,141
Cerebrovascular disease (430–438)							
Persons aged 35–64 years	3.7	1.4	5,121	4.8	1.4	4,504	9,625
Persons aged ≥65 years	1.9	1.3	11,554	1.5	1.0	5,134	16,688
Atherosclerosis (440)	4.1	2.3	4,644	3.0	1.3	3,612	8,256
Aortic aneurysm (441)	4.1	2.3	5,798	3.0	1.3	1,435	7,233
Other arterial disease (442–448)	4.1	2.3	1,874	3.0	1.3	1,111	2,985
Respiratory diseases							
Pneumonia, influenza (480–487)	2.0	1.6	11,580	2.2	1.4	8,098	19,678
Bronchitis, emphysema (491–492)	9.7	8.8	9,670	10.5	7.0	5,269	14,939
Chronic airways obstruction (496)	9.7	8.8	29,838	10.5	7.0	16,884	46,722
Other respiratory diseases (010–012, 493)	2.0	1.6	828	2.2	1.4	690	1,518
Pediatric diseases (<1 year of age)							
Short gestation, low birthweight (765)	1.8		344	1.8		261	605
Respiratory distress syndrome (769)	1.8		351	1.8		233	584
Other respiratory conditions of newborn (770)	1.8		384	1.8		277	661
Sudden infant death syndrome (798)	1.5		422	1.5		280	702
Burn deaths‡			850			453	1,303
Passive smoking deaths§			1,330			2,495	3,825
Total			286,824			147,351	434,175

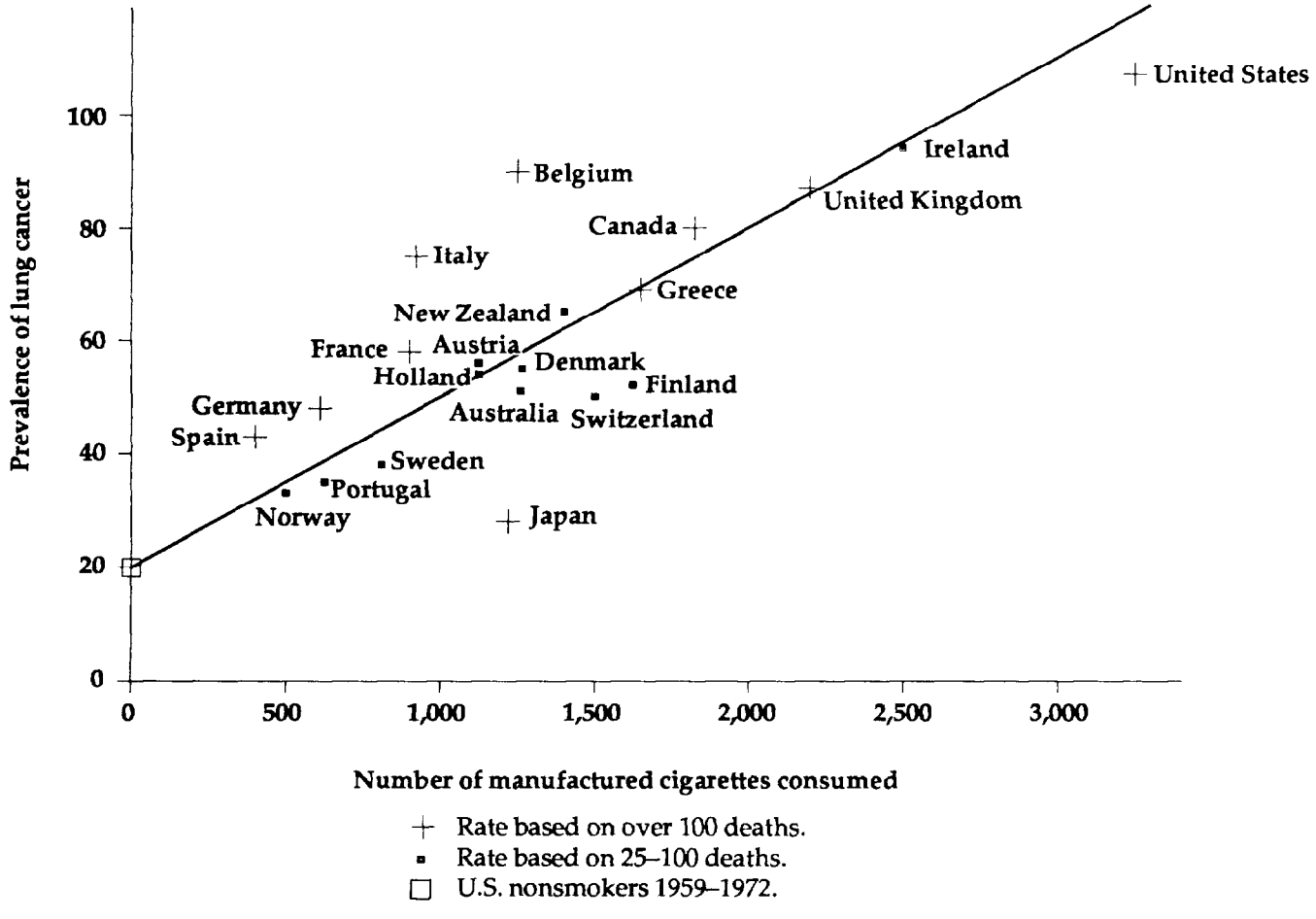
Source: Centers for Disease Control (1991).
*Relative to never smokers.
†*International Classification of Diseases, Ninth Revision, Clinical Modification.*
‡Data from the Federal Emergency Management Agency, 1990.
§Deaths among nonsmokers from lung cancer attributable to passive smoking; National Research Council (1986).

Several estimates have been made for the United States (Rice et al. 1986; Hodgson 1988), Canada (Collishaw and Myers 1984; Forbes and Thompson 1983a), the United Kingdom (Atkinson 1974), Sweden (Hjalte 1984), and Switzerland (Leu and Schaub 1984). Various factors should be included in a complete picture of the economic impact of smoking-related illness (Table 2), but few published studies have addressed all of these factors, and most studies have concentrated on factors for which data are available.

Most estimates of the costs of smoking-related illness calculate the direct costs of treating persons with smoking-related diseases, including the costs of hospital and nursing-home care, physicians' fees, and medications (Table 3). The specific items included in the estimates vary among studies, which also differ with regard to the medical conditions attributed to smoking. Some studies include lung cancer only, while others include heart disease and chronic obstructive pulmonary disease (COPD). Other studies compare differences in the overall use of health care by smokers and nonsmokers. However, these estimates do not include nonmedical components of direct costs, such as the costs of transportation to health care providers or of modifying an environment to accommodate a person with a severe chronic illness.

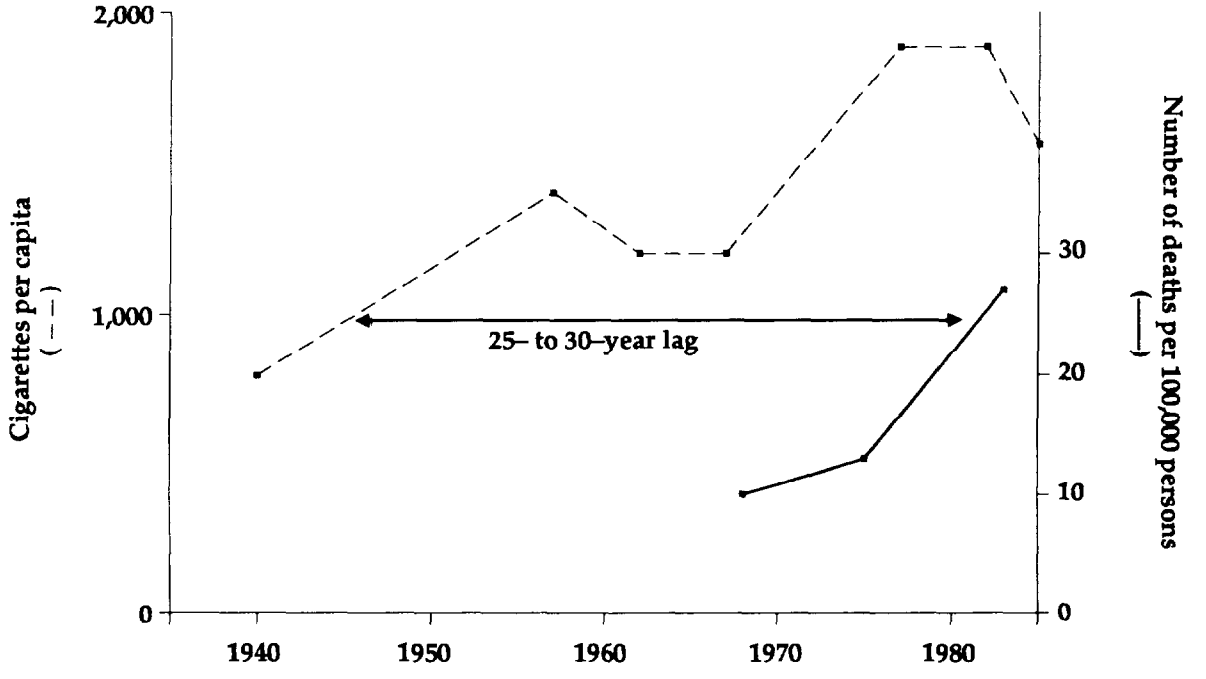
Estimates of the indirect costs of smoking-related illness attempt to measure the productivity lost or output forgone as a result of smoking-related illness or death (Table 4). This so-called human capital approach has been criticized for placing a high value on losses sustained by young adults, men, and more-

Figure 1. Correlation between cigarette consumption per person who entered adult life in 1950 and lung cancer rate for that generation as it entered middle age in mid–1970



Source: Doll and Peto (1981).

Figure 2. Per capita rate of cigarette consumption in Brazil and lung cancer deaths for men in Rio Grande do Sul, Brazil



Source: The World Bank (1989a).

educated persons (Markandya and Pearce 1989). In addition, earnings lost because of illness and mortality may have little relationship to the value people place on their life or health (Markandya and Pearce 1989). A more appropriate measure of that value may be the amount they are willing to pay to reduce the probability of death or disease. Although several attempts have been made to estimate willingness-to-pay for non-smoking-related illness (Viscusi 1990), this approach has not been applied to cost-of-smoking studies. In addition, no value has been assigned to intangible items, such as pain and suffering, premature death, and loss experienced by relatives; accordingly, these intangibles have not been included in any published estimates of the costs of smoking. Some estimates include costs associated with the harmful effects on the fetus and on newborns of maternal smoking during pregnancy and of postnatal exposure to environmental tobacco smoke (Forbes and Thompson 1983b); however, most published estimates do not incorporate measures of external costs (those borne by persons other than smokers).

The transfer payments (pension benefits and sick benefits) associated with smoking-related illness have been a source of confusion and controversy. Transfer payments reflect who pays for and who benefits from smoking-related illness; these transfers are not, strictly speaking, economic costs because they do not reflect resources consumed or lost due to smoking. However, discussions of smoking-control policies have frequently asked whether smokers in economically advanced societies (with well-developed public or private health care financing, disability, and pension systems) cover the costs of their own illness (Manning et al. 1989; Schelling 1986; Garner 1977).

Accurate estimation of the cost of smoking is influenced by the quality of data available, current demographic circumstances, and competing mortality risks. Cost estimates require reliable data on smoking behavior, the incidence of smoking-related illnesses, and the prevalence of such illnesses at death. In many developing countries, vital statistics are unreliable or incomplete (see Chapter 3, "Smoking-Attributable Mortality in Latin America and the Caribbean"), although several Latin American and Caribbean countries have well-established national statistical registries (World Health Organization [WHO] 1989) from which reliable estimates can be constructed.

Table 2. Components of the costs of the health effects of smoking

Component	Definition
Direct costs	
Medical care	Costs of treatment for smoking-related illness.
Other	Nonmedical costs of smoking-related illness.
Indirect costs	
Morbidity costs	Loss of earnings and/or housekeeping services due to smoking-related illness.
Mortality costs	Loss of earnings and/or housekeeping services due to premature death from smoking-related illness.
Intangible costs	
Pain and suffering	Cost to individual of pain and suffering from smoking-related illness.
Premature death	Cost to individual of premature death due to smoking.
Relatives' loss	Cost to smoker's relatives and friends because of concern for smoker's health, observation of sickness and suffering, and grief and suffering due to smoker's premature death.
Transfer payments	
Taxes	Reduced taxes paid by smokers due to illness-related reductions in earnings.
Pension benefits	Value of transfer payments such as pensions paid or forgone due to premature death.
Sick benefits	Health care costs paid by public or private insurance plans. Sick pay and disability benefits paid to smokers during illness.
External costs	Effects of smoking on nonsmokers, including deleterious health effects and the annoyance of exposure to environmental tobacco smoke. Includes the deleterious effects of maternal smoking on the fetus, on infants, and on children.

A country's demographic configuration influences the degree to which smoking-related illness becomes manifest. Since many smoking-related illnesses do not have an important impact on persons under age 50, such illnesses do not significantly contribute to mortality in countries where life expectancy after infancy is low; however, low life expectancy affects only a small proportion of the population in Latin America and the Caribbean (Chapter 3, "Life Expectancy and Mortality").

The manifestation of smoking-related illness is also a function of competing morbidity and mortality. Latin American and Caribbean countries are at different stages of epidemiologic transition, and the chronic conditions associated with smoking may be obscured by the continued presence of infectious diseases and other disorders. Countries also vary in the extent to which background conditions (nutritional, genetic, or environmental) interact with smoking.

Another limitation of cost-of-smoking studies is the method used to calculate attributable risk (AR).[1] Although quite useful, this calculation must be applied judiciously; it attributes all differences between ever smokers and never smokers to smoking, and it may overestimate the level of smoking-related illness. Smokers and never smokers differ in several characteristics, including diet and level of alcohol consumption, exercise, and education (USDHHS 1990), all of which may be associated with differences in health outcomes. Leu and Schaub (1983) developed the hypothetical construct of the "nonsmoking smoker-type," a person who is like a smoker in all ways except smoking, to serve as the standard of comparison in estimating costs of smoking. This construct was also used by Manning and associates (1989) to calculate the lifetime external costs of smoking in the United States. However, the concept may not be useful in many developing countries because of the variability of competing factors in different settings.

In attempting to estimate tobacco-related diseases in developing countries, some researchers have used a single measure of AR for each of the major smoking-related illnesses, such as lung cancer, heart

[1] A detailed discussion of the theory, limitations, and other methodologic issues concerning the calculation of AR and smoking-attributable disease and mortality is presented in the Surgeon General's 1989 report (USDHHS 1989).

Table 3. Medical care costs for smokers, by study type and author

Study type and author	Country	Year of estimate	Total cost (billions)*	Cost per smoker*
Annual costs (prevalence-based estimates)				
Collishaw and Myers (1984)†	Canada	1979	1.64	164
Luce and Schweitzer (1978)	United States	1976	52.02	868
Rice et al. (1986)	United States	1984	24.85	444‡
Stoddart et al. (1986)†§	Canada (Ontario)	1978	0.34	127
Thompson and Forbes (1983)†	Canada	1980	3.04	302
U.S. Office of Technology Assessment (1985)	United States	1985	12–35	214–870
Lifetime costs (incidence-based estimates)				
Manning et al. (1989)‖	United States	1983		6,113
Oster, Colditz, Kelly (1984)	United States	1980		2,474–6,576¶ 1,147–4,138**
Hodgson (1990)	United States	1985	501.0	6,239††
Hjalte (1984)†	Sweden	1980	0.18	73

*Converted to 1985 U.S. dollars by using U.S. Bureau of the Census (1988) Table 738 consumer price index.
†Markandya and Pearce (1989) report these estimates converted to 1980 U.S. dollars.
‡Total cost divided by 56 million smokers in the United States in 1985; U.S. Department of Health and Human Services (1989).
§Public expenditure only.
‖0.33 cost per pack x 16,300 packs = $5,379 (1983 U.S. dollars).
¶Men aged 40–44 light (1–14 cigarettes per day) to heavy (≥35 cigarettes per day) smokers.
**Women aged 40–44 light (1–14 cigarettes per day) to heavy (≥35 cigarettes per day) smokers.
††Lifetime cost for all smokers >25 years old.

disease, and COPD (90, 26, and 75 percent, respectively) (Pan American Health Organization [PAHO] 1989). Such use of AR can be misleading because the proportion of current and former smokers varies across countries and over time, and the relative risk is a function of smoking patterns (e.g., the number of cigarettes smoked daily and the duration of smoking), which also vary (USDHHS 1989). For example, Joly and colleagues (1983) reported that of all lung cancers for Cuba in 1984, 63 percent among women and 91 percent among men were caused by smoking; for U.S. women and men in the mid-1980s, the attribution proportions were 75 and 80 percent, respectively (Centers for Disease Control [CDC] 1987). Moreover, the relative risk for smoking is also determined by nontobacco causes of illness, and these differ among countries. Applying an exogenously determined set of AR proportions to any country's population may lead to unreliable estimates of the level and costs of smoking-related illness. However, for countries that lack endogenous data, this procedure is often the only alternative (see Chapter 3, "Smoking-Attributable Mortality in Latin America and the Caribbean").

Prevalence- and Incidence-Based Studies

The prevalence-based approach to measuring the economic costs of tobacco-related disease has frequently been used, largely because of its relatively simple methodology, the availability of the data needed for the calculations, and the consistency of carefully made estimates (Rice et al. 1986) (Table 3).

Several of these prevalence-based studies (Luce and Schweitzer 1978; USOTA 1985; Rice et al. 1986; Collishaw and Myers 1984) indicate that the costs of smoking in any one year are likely to be great and that the economic costs of smoking should be taken

Table 4. Value of productivity lost due to mortality and morbidity, by study type and author

Study type and author	Country	Year of estimate	Mortality		Morbidity	
			Total cost (billions)	Cost per smoker	Total cost (billions)	Cost per smoker
Annual costs (prevalence-based estimates)						
Collishaw and Myers (1984)	Canada	1979	4.04	405	0.75	74
U.S. Office of Technology Assessment (1985)	United States	1985	27–61	484–1,080[*†]		
Rice et al. (1986)	United States	1984	9.63	172[‡]	21.74	388[‡]
Lifetime costs (incidence-based estimates)						
Leu and Schaub[§] (1984)	Switzerland	1976	0.28–0.35	149–183	0.14–0.25	76–132
Oster, Colditz, Kelly (1984)	United States	1980		24,221–68,316[†‖] 5,894–21,765[†¶]		

[*]Total cost divided by 56 million smokers in the United States in 1985; U.S. Department of Health and Human Services (1989).
[†]Range includes both mortality and morbidity losses.
[‡]Converted to 1985 U.S. dollars by using U.S. Bureau of the Census (1988) Table 738 consumer price index.
[§]Markandya and Pearce (1989) report these estimates converted to 1980 U.S. dollars.
[‖]Men aged 40–44 light (1–14 cigarettes per day) to heavy (≥35 cigarettes per day) smokers.
[¶]Women aged 40–44 light (1–14 cigarettes per day) to heavy (≥35 cigarettes per day) smokers.

seriously. These studies estimate expenditures for medical care for tobacco-related diseases, workdays lost, and future productivity lost due to smoking-related deaths during the year. However, these studies do not address other issues that most concern policymakers, including the economic impact of decreased prevalence of cigarette smoking, the length of time before economic effects are realized, the economic benefits of not smoking, and a comparison of the lifetime illness costs of smokers with those of nonsmokers (Hodgson 1990). Health care expenditures tend to increase just before death, but smoking shortens life expectancy and changes the pattern of health care expenditures. The question arises whether the health care costs incurred by smokers, when adjusted for the altered temporal pattern, exceed costs incurred by never smokers.

Most cost-of-illness studies are based on estimates of the prevalence of illness in a particular year. Because many smoking-related illnesses are chronic and the latent period between initiation of smoking and onset of illness is long, prevalence-based cost estimates reflect the consequences of historical trends in smoking, which may differ among countries at different times. Accordingly, prevalence-based cost estimates cannot be used to predict the impact of smoking-control policies or to predict the impact of increases in smoking, except after long periods.

For policymakers, incidence-based, or lifetime, estimates of the costs of smoking-related illness may be more useful than prevalence-based estimates (Leu and Schaub 1983; Manning et al. 1989; Oster, Colditz, Kelly 1984). In the incidence-based model, the economic costs of smoking are estimated as the average additional costs per smoker, due to smoking-related illnesses, incurred over the smoker's lifetime. Estimates can be made of direct (medical care expenditures) and indirect (e.g., lost wages, salaries, and housekeeping services) costs of smoking and of the benefits of quitting. For lung cancer, coronary heart disease, and emphysema, the discounted value of anticipated lifetime costs has been estimated for smoking-related diseases in persons who smoked in 1980 and continued to smoke (Oster, Colditz, Kelly 1984). The costs of the benefits of quitting can be estimated as the difference between the cost-of-smoking estimate and the expected costs of former smokers, which reflect the gradual rate of decline in risk for smoking-related diseases.

Estimates of each smoker's lifetime cost of smoking differ by the person's age, sex, and quantity smoked (Oster, Colditz, Kelly 1984). For example, the

lifetime costs of smoking for a 45-year-old man who is a heavy smoker are significantly greater than those of a 65-year-old woman who is a light smoker ($46,334 vs. $2,462; in 1980 U.S. dollars). Oster and colleagues suggest that estimates of the costs of the benefits of quitting are less than the costs of smoking and that benefits vary according to the characteristics of individual smokers. The expected costs of both smoking and the benefits of quitting were sizable for all groups of smokers (Oster, Colditz, Kelly 1984).

Recently, Hodgson (1990) analyzed data on use and costs of medical care and on mortality for specific age groups in cross sections of the U.S. population to generate profiles of lifetime health care costs beginning at age 17. Because expenditures are higher for persons who die than for those who survive, the analysis distinguished between the two groups within a given age range. The profiles, estimated for men and women by age and amount smoked, include the costs of inpatient hospital care, physician services, and nursing-home care. However, the cost of drugs and dental care, as well as morbidity and mortality costs, are excluded. Hodgson concluded that, despite the higher death rate for smokers, the cumulative impact of the excess medical care used by smokers while alive outweighs their shorter life span and that smokers incur higher medical care costs during their lifetime. For all smokers, excess medical care costs increase with the amount smoked. Hodgson (1990) estimated that the U.S. population of civilian, noninstitutionalized persons aged 25 years or older who ever smoked cigarettes will incur lifetime excess medical care costs of $501 billion (1990 U.S. dollars discounted at 3 percent) or $6,239 per current or previous smoker (Table 3). This excess is a weighted average of the costs incurred by all smokers, whether or not they develop smoking-related illness. For smokers who do develop such illnesses, the personal financial impact is much higher.

Lifetime or incidence-based cost-of-illness estimates are preferred over prevalence-based estimates for measuring the costs of changes in, and trends affecting, the incidence of disease. However, lifetime cost estimates require knowledge of the natural history of disease, the pattern of medical care use, and the occurrence of co-morbidity. Lifetime costs are often estimated from current profiles for cross sections of populations at different ages and at different stages of disease. To measure the potential impact of changes in public policies and demographics on future health care costs, projections of cost estimates must be made. Changes in parameters, such as technologic change and its rate of diffusion, must be considered, or estimates may be biased and misleading (Hodgson 1988).

The incidence-based approach is better suited than the prevalence-based approach for estimating the costs of smoking because the former relates current changes in smoking behavior to future changes in the costs of smoking-related illness. The incidence-based approach, however, suffers from the limitations of transferability between countries (mentioned above); it does not directly address intangible costs and externalities; and it values mortality and morbidity by measuring forgone earnings rather than willingness-to-pay. Moreover, even for economically advanced countries, including the United States, the incidence-based approach is limited by the lack of adequate and comprehensive data; for less-developed countries, this limitation may be exacerbated.

Application to Developing Countries

The cost-of-illness studies conducted in the United States and other developed countries reflect health care rendered in technologically sophisticated, expensive health care systems. In many other parts of the world, health care delivery systems are less technologically advanced, and access to sophisticated therapy is frequently limited to residents of large metropolitan areas. Thus, the costs and benefits of health care services in one area may differ significantly from those found in other areas. Using the experience of North American and European countries to predict trends in health care for much of the rest of the world is speculative because both the future development of medical technology and the rate of its transference across national boundaries are largely unknown.

Few estimates are available on the costs of smoking-related illness in Latin American and Caribbean countries. In one report, an average of 19,000 deaths were attributable to smoking-related diseases in Venezuela during 1980 to 1984 (PAHO 1992). The costs of medical care and employee absenteeism associated with smoking-related illness in Venezuela increased significantly from 1978 to 1985 (from US$69 million to US$110 million). Because of the wide variation among countries in demographic structure, morbidity and mortality, health care systems, and prevalence of smoking, these results cannot be generalized to all of Latin America and the Caribbean.

Financing of Health Care and Pension/ Disability Funds

Considerable attention has been focused on not only the size of the economic burden of smoking-related illness but also on how societies will bear that burden. Miscalculations of economic burden have been derived by dividing prevalence-based estimates of the costs of smoking-related illness by the quantity of

cigarettes sold. The resultant quotient has been reported as the per cigarette cost of smoking borne by society. For example, in the United States, $2.17 is frequently quoted as the cost of smoking per pack of 20 cigarettes (USOTA 1985). This overall cost fails to distinguish between the costs of smoking borne by smokers (internal costs) and those borne by others (external costs). The discussion of taxation (later in this chapter) explains how the magnitude of the burden imposed on nonsmokers by smokers is as much a function of the institutional arrangements for financing health care, sick pay, disability, and retirement pensions as it is of the costs of smoking-related illness. Therefore, the incidence of the health costs of smoking varies among countries depending on the structure and scope of each country's social insurance system.

Different national systems finance health care, disability, and retirement within the Americas. In some countries, participation in benefit programs is financed by payroll taxes or job-related insurance premiums. These types of programs are limited to persons who participate in the formal economy. Although national health insurance systems are mandated in some countries, a low level of funding may limit the scope of public systems and lead to the creation of private markets for health services. Information on the formal health care system may be inadequate for measuring the external costs of smoking-related illness; data may be needed on the actual source and disposition of funds.

The U.S. health care system is financed by various government and private payment sources. In the United States in 1985, direct payments accounted for 24 percent and private insurance—principally provided by businesses for their employees—accounted for 33 percent of the total personal health care expenditures. The federal government paid for 30 percent, mostly through Medicare (a federal program for disabled persons and persons aged 65 or older) and Medicaid (a program that provides health care for the poor). State and local governments paid for 11 percent of health care expenditures, largely through contributions to the Medicaid program. Government health programs are financed by various mechanisms, including a payroll tax. The cost of employer-financed health insurance is included in total payroll costs and is reflected in prices, profits, and wage rates. Public old-age pensions and disability payments are financed through the federal Social Security Administration for most persons in the work force, but private plans account for a substantial proportion of benefits (Lazenby and Letsch 1990).

In Canada, health care is financed through a national system separately administered by each province, with some direction and funding from the federal government. The Canadian government finances a comprehensive set of medical benefits and restricts funding by private sources, but Canadian citizens can select their own health care providers. Physicians' fees and hospital budgets are negotiated by the government, and savings are achieved in part through the administrative simplicity of the insurance plans. In 1987, Canada spent US$1,483 per person for personal health services, and the United States spent US$2,031 (Igelhart 1989). In 1987, personal health services accounted for 8.6 percent of the total gross domestic product (GDP) in Canada and 11.2 percent in the United States (Igelhart 1989). These comparisons suggest that, on a per capita basis, Canada spends less on smoking-related illness than the United States does.

Brazil has a mixed public and private system for financing health care but is moving toward a new constitutionally mandated, unified, and decentralized health system (The World Bank 1989a). Brazil spends approximately 5 to 6 percent of its total GDP on health care, an amount divided almost equally between the private and public sectors. About half of all public financing for health care is channeled through the National Institute for Medical Assistance and Social Security and is tied to employment (The World Bank 1989a). Health services, primarily basic services for the urban and rural poor, are funded by the Ministry of Health through the general budget. State and local governments, which also finance health care, accounted for 27 percent of public expenditures on health in 1986. Private health care is financed by individual persons, who directly pay fees for services, and private insurance, largely financed by employers, which features various capitation and reimbursement-for-expenditures insurance plans. In a recent survey of the Brazilian health care system, The World Bank concluded that "resources have been poorly allocated; little is spent on prevention and much on curative care (70 percent on hospitals alone); little is spent on the poor, and much on the middle class" (The World Bank 1989a, p. 44).

In Venezuela, as in Brazil, access to health care is constitutionally guaranteed, but care is delivered both privately and through various government programs (Morgado 1989). The Ministry of Health is responsible for providing health care, and approximately two-thirds of the country's physicians are employed by the Ministry in some capacity. In addition, largely unregulated private insurance reimburses both physicians and private hospitals on a fee-for-service basis. The physician-to-population ratio is high; however, as in other Latin American countries, physicians are concentrated in the large urban centers.

The costs of smoking-related diseases may be substantial in Brazil, Venezuela, and other countries of the Americas with similar health care systems. The concentration of health care resources for curative care (mainly hospital and fee-for-service physicians' care) in urban, middle- and upper-class areas suggests that these groups consume a disproportionate share of the resources and that smoking-related diseases in these groups are treated aggressively. Smoking-related diseases may also be a more important source of illness in urban, high-income groups than in low-income groups because persons of high income are likely to have a longer, more intense exposure to tobacco use and a longer life span during which smoking-associated diseases may become manifest.

Costs of Smoking-Control Policies and Programs

Knowledge of the dangers of tobacco use and concern for public health have led to the development of smoking-control policies in several countries. (See Chapter 6 for a discussion of control efforts.) Many of these policies—such as restrictions on advertising, warning labels on tobacco packages and in advertisements, restrictions on smoking in public places, and increases in tobacco taxes—use few direct resources, but hidden or intangible costs may be associated with such policies. However, other smoking-control policies—such as public and school education programs, lobbying efforts of smoking-control advocates, and enforcement of restrictions on cigarette sales, advertising, and smoking in public places—use resources that can be considered part of the costs of smoking.

The 1989 report of the Surgeon General presents a detailed analysis of smoking-control activities in the United States (USDHHS 1989). Such activities have recently increased significantly in Canada, where the federal, provincial, and municipal governments have moved to increase tobacco taxes, restrict tobacco advertising, strengthen product warnings, restrict smoking in public places, and help tobacco growers diversify and produce other crops (Collishaw, Kaiserman, Rogers 1990). Except for the program to discourage tobacco cultivation, these policies and programs use few direct resources. These programs reflect, in part, the health advocacy of more than 30 voluntary agencies working individually and collectively (as the Canadian Council on Smoking and Health). Such advocacy activities, although rarely costed-out, consume resources that should be included in estimates of the costs of smoking-control activities.

Through the initiative of local medical leaders and health and education authorities, Brazil's first antismoking campaign began in Pôrto Alegre in 1976 (The World Bank 1989a), spread to other regions, and gained support. In 1985, the Ministry of Health began to develop a national program to control smoking. A recent evaluation by The World Bank (1989a) cited the Brazilian program as a success, although the effects of the program on smoking patterns have not been formally assessed. Health planners from The World Bank found that "public information and personal smoking-cessation services," which cost only 0.2 to 2 percent of per capita gross national product (GNP) for each year of life gained, were the most cost-effective of the preventive and therapeutic interventions reviewed. In contrast, treatment for lung cancer cost 200 percent of per capita GNP per year of life gained. This comparison suggests that public information programs designed to control smoking in Brazil are extremely cost-effective.

Economics of the Tobacco Industry

The Tobacco Sector

Overview

From an economic perspective, the existence of a market for tobacco indicates that tobacco produces some economic benefits, including (1) consumer satisfaction from smoking and other forms of tobacco use and (2) income to producers in excess of the cost of resources for tobacco production. Tobacco production also generates costs—principally the value of resources used to manufacture tobacco products. Confusion about the costs and benefits of tobacco production has been spawned by tobacco industry analysts who label the value of the land, labor, and capital used in tobacco production as a benefit of such production (Tobacco Growers' Information Committee, n.d.;

Agro-economic Services Ltd. and Tabacosmos Ltd. 1987). In fact, because the resources used in tobacco production are not being used for other products, the cost of these resources is the true resource cost of tobacco production. The value of the alternative goods that could be produced with the resources allocated to tobacco production is a measure of the opportunity costs of producing tobacco. A tobacco industry may also generate tax revenues, which are neither benefits nor costs to a society. Rather, taxes are transfers of resource claims from one segment of society to the government for redeployment. Subsidies, such as agricultural support programs, are also transfer payments.

The cultivation of tobacco is prima facie evidence of tobacco's net contribution to growers' incomes. Although tobacco production may be very profitable for the individual producer, it is not necessarily beneficial economically. Subsidies and externalities associated with the production of tobacco may lead to a divergence between what is best for producers and what is best for society as a whole.

Demand for Tobacco

Worldwide consumer demand for tobacco products drives the market for tobacco. In the economist's view, this demand originates from consumer efforts to satisfy exogenously determined wants, which are subject to constraints on consumer resources. Such constraints include limits on time and disposable income. By using information about products and prices, each consumer purchases a mix of goods to maximize consumer satisfaction.

One of tobacco's benefits is the avoidance of nicotine withdrawal symptoms by addicted smokers. This benefit and other pleasurable sensations, called "utility" by economists, may have many components, including status, enjoyment, relaxation, a sense of security, affiliation with other smokers, and perhaps in certain cultures, a sense of being modern or progressive. However difficult these attributes are to measure, economists posit that when consumers choose to spend some of their own limited resources on tobacco, they reveal their preference for purchasing tobacco than for engaging in other forms of consumption or savings.

Price is a measure of the amount of alternative goods forgone to purchase tobacco products. (The effects of variation in cigarette price on tobacco consumption are discussed later in this section.) Tobacco products, as well as most consumer goods, tend to obey the law of downward sloping demand—as price falls (rises), quantity demanded increases (decreases). Factors that increase the retail price of cigarettes, including taxes, tariffs, and import quotas decrease consumption. The cost of raw tobacco is generally not an important factor in the retail price of tobacco products. In addition, although the supply of cigarettes does not affect demand directly, supply influences consumption through the market price: as supply increases, price tends to decrease, which stimulates consumption until the additional sales clear the market. Factors other than price that influence the demand for cigarettes and other tobacco products are cited in Figure 3.

Income determines a consumer's command over resources and limits consumption options. In general, the consumption of most goods increases as income increases, but at a decreasing rate as consumers reach satiety for a particular good. The income elasticity of demand is defined as the percent change in the quantity demanded divided by the percent change in income that caused the demand change. The relation of consumption to income can be observed for individuals, groups, and countries, for which income and consumption fluctuate over time, and for variations in income and consumption among groups at a particular time.

For countries in the Americas, the correlation is positive between per capita cigarette consumption and per capita GNP (Figure 4 and Table 5). This relation is stronger in less-developed countries in

Figure 3. Factors, other than price, that affect the demand for tobacco products

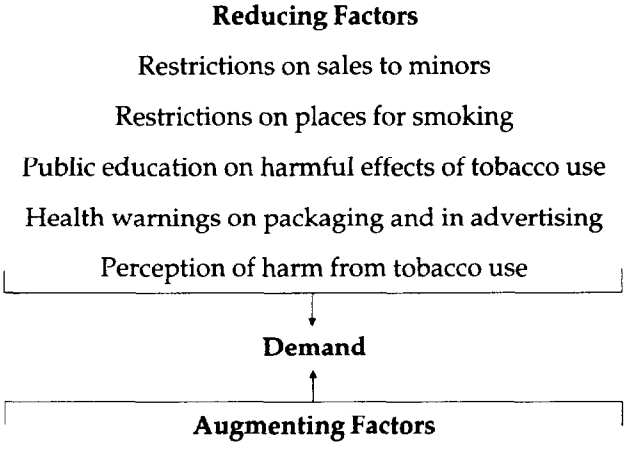
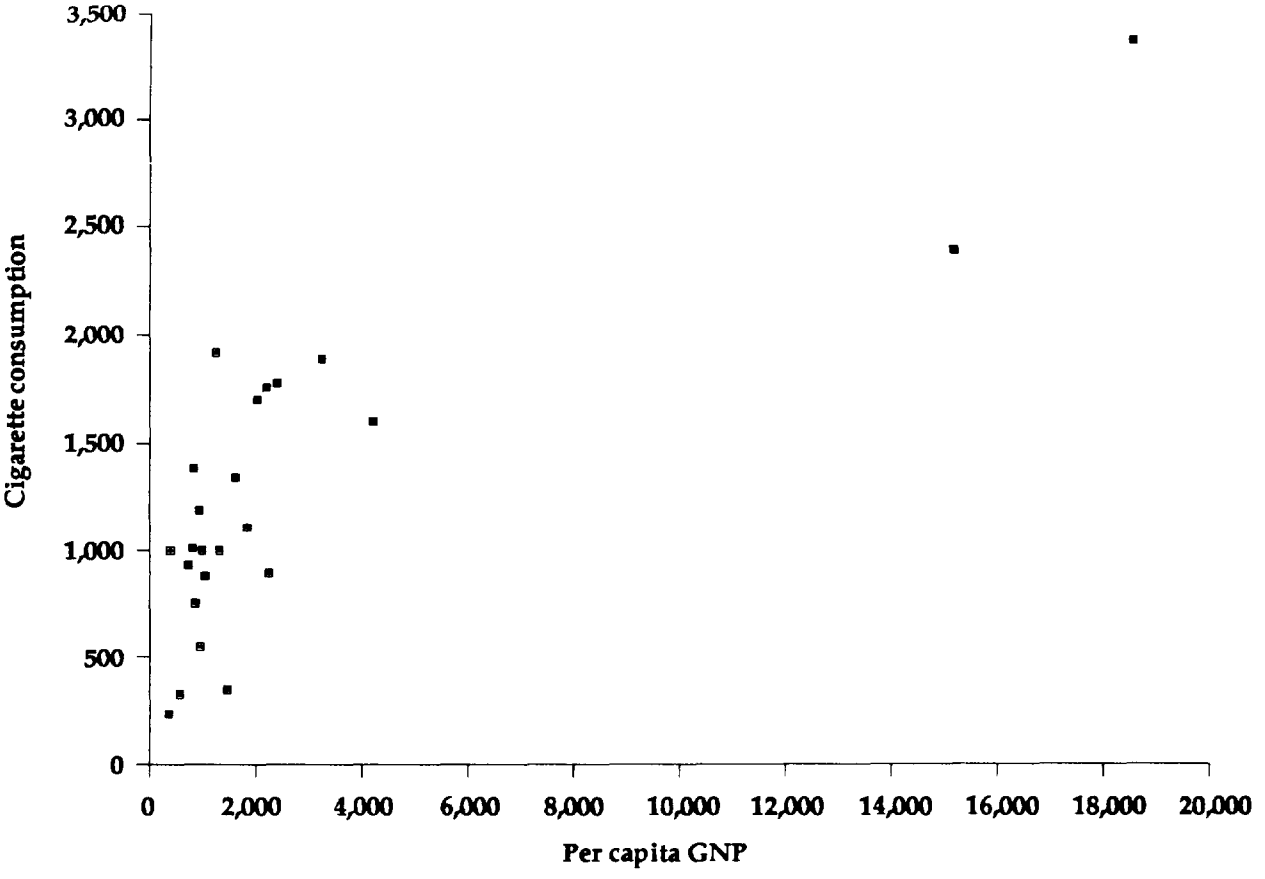


Figure 4. **Per capita cigarette consumption and annual per capita gross national product* (GNP) in 24 countries of the Americas,† 1985**



*Using a model that compares the annual per capita consumption of cigarettes to the log of the GNP, the relationship is expressed by the following linear regression equation: Consumption = -3241 + 616 ln(GNP per capita) (R^2 = .68). This equation was used to calculate the elasticities discussed in the text.
†See Table 5.

which rising incomes frequently lead to increased cigarette consumption due to an increase in the percentage of the population that smokes and in the amount each smoker smokes and to a shift from homemade and roll-your-own cigarettes to more-expensive, factory-made, higher-quality tobacco products.

Several studies indicate that income elasticity measured for multiple countries is higher than that measured for a single country (Table 6). The estimates reported by Chapman and Richardson (1990) and Townsend (1990), and the estimate based on the data in Figure 4, cluster around 0.50 (0.45 to 0.55). However, elasticity tends to fall as income rises, and near-zero estimates have been reported for developed countries (Table 6). In the model that compared consumption to the logarithm of GNP (Figure 4), estimated income elasticity of demand is approximately 2.0 at the lower end of GNP but falls to almost zero (0.04) at the upper end.

Restrictions on cigarette sales or on where smoking is permitted make smoking more difficult. These restrictions raise the total effective price of cigarettes for consumers and reduce cigarette consumption. Increased perception of the harm of cigarette smoking also depresses demand by increasing the total price of cigarettes (including health-associated costs) or by affecting taste.

Physical characteristics of cigarettes, such as filters, and aspects of taste, which include strength, flavor, and smoothness, augment demand. In many countries, the modern tobacco industry developed

Table 5. Per capita* cigarette consumption and income in the Americas

Country	Per capita cigarette consumption (1985)	GNP† per capita (US$) (1987)	Change in consumption (%) (1970–1985)	Average annual growth in GNP (%) (1965–1987)‡
North America				
United States	3,370	18,530	-15	1.5
Canada	2,392	15,160	-30	2.7
Latin America				
Argentina	1,780	2,390	3	0.1
Bolivia	330	580	10	-0.5
Brazil	1,700	2,020	30	4.1
Chile	1,000	1,310	-7	0.2
Colombia	1,920	1,240	15	2.7
Costa Rica	1,340	1,610	-20	1.5
Cuba	3,920		-2	
Dominican Republic	930	730	-11	2.3
Ecuador	880	1,040	26	3.2
El Salvador	750	860	-21	-0.4
Guatemala	550	950	-26	1.2
Haiti	240	360	-55	0.5
Honduras	1,010	810	7	0.7
Mexico	1,109	1,830		2.5
Nicaragua	1,380	830	10	-2.5
Panama	894	2,240		2.4
Paraguay	1,000	990	4	3.4
Peru	350	1,470	-10	0.2
Uruguay	1,760	2,190	14	1.4
Venezuela	1,890	3,230	-4	-0.9
Caribbean				
Barbados	1,380		20	
Guadeloupe	1,080		-1	
Guyana	1,000	390	-26	-4.4
Jamaica	1,190	940	-34	-1.5
Suriname	1,660		60	
Trinidad and Tobago	1,600	4,210	-16	1.3

Source: The World Bank (1989b); U.S. Department of Health and Human Services (1989); Chapman and Wong (1990).
*Aged 18 years or older.
†GNP = Gross national product.
‡1982–1988 data.

because of a shift in consumption from traditional forms of tobacco to modern, machine-made, quality-controlled, flavored cigarettes made from blends of tobacco, including *tabaco rubio*, a flue-cured tobacco. Some authorities have suggested that the development of filter-tipped cigarettes and long, slim cigarettes has increased smoking among women (see Chapter 2, "The Emergence of the Tobacco Companies"). The addictive nature of tobacco, another demand-augmenting factor, is discussed in a prior report (USDHHS 1988).

The degree of competitiveness or structure of the market for tobacco products can also affect the demand for cigarettes by operating on retail price, product differences, and product promotion. In many countries, the market for tobacco products may be reserved for a government-operated or sanctioned monopoly, but cigarette markets in the Americas are characterized by oligopoly—dominance of the market by several large firms (see Chapter 2, "The Emergence of the Tobacco Companies"). Prices tend to be lower and aggregate advertising and promotion expenditures

Table 6. Estimates of income elasticity of demand for cigarettes

Study	Data	Elasticity
Chapman and Wong (1990)	Worldwide, 1980	.45*
Chapman and Wong (1990)	Countries with gross national product <$5,000 per capita, 1980	.55*
Walsh (1980)	Ireland, 1953–1976	.33
Witt and Pass (1981)	United Kingdom, 1955–1975	.13
Lewit and Coate (1982)	United States, 1976	.08
Townsend (1990)	Europe, 1987–1988	.46
Data in Figure 4	24 countries of the Americas, 1985	.49

*Estimates calculated for this report from data provided in Chapman and Wong (1990).

tend to be higher in oligopoly markets than in monopoly markets, because of competition. In addition, oligopoly markets are characterized by greater variety as firms attempt to capture market niches for specific products.

Cigarette advertising and the sponsorship of entertainment, sporting, and cultural events are intended to increase the demand for particular cigarette brands. Measuring the effect, if any, of such advertising on aggregate demand is problematic. Accordingly, public policy toward cigarette advertising and promotional activities is controversial in many countries. Assessment of the impact of tobacco advertising and advertising restrictions was presented in the Surgeon General's 1989 report (USDHHS 1989) and is updated below.

Advertising

In the United States, cigarettes are one of the most heavily advertised products, and the mix of advertising and promotion has changed over time. Cigarette commercials have been prohibited from television and radio since 1971. In 1975, 75 percent of expenditures were directed toward traditional print advertising media (newspapers, magazines, billboards, and point-of-sale posters) and 25 percent toward promotional activities, such as coupons, free samples, public entertainment, and allowances to retailers (CDC 1990). By 1988, when total expenditures reached $3.27 billion, promotional activities accounted for more than two-thirds of all advertising and promotional expenditures. Despite the sizable decline in the use of traditional print media from 1975 to 1988, cigarettes were in 1988 the product most heavily advertised on outdoor media, the second most heavily advertised in magazines, and the sixth most heavily advertised in newspapers (CDC 1990).

In many other countries of the Americas, tobacco advertising expenditures are substantial (Table 7), despite restrictions on advertising activities (see Chapter 5). The Canadian Tobacco Products Control Act banned all tobacco advertising in the Canadian print media beginning January 1, 1989, and required that outdoor advertising on billboards and sponsorship of sporting and cultural events be phased out (Collishaw, Kaiserman, Rogers 1990). This advertising ban is currently being contested by Canadian tobacco companies in a protracted court case (Collishaw, Kaiserman, Rogers 1990).

Advertising aims to increase profit by increasing demand for a particular product (Scherer 1980). In oligopoly markets, advertising is used to differentiate

Table 7. Estimated advertising expenditures* of tobacco industry in selected countries of the Americas

Country	Cost
United States	$3,270.0
Canada	88.0†
Argentina	18.5
Brazil	68.0
Costa Rica	1.8
Dominican Republic	2.4
Ecuador	1.0
El Salvador	0.9
Guatemala	1.8
Mexico	19.8
Panama	1.8
Uruguay	0.7

Source: Philip Morris International Inc. (1988); ERC Statistics International Limited (1988); Centers for Disease Control (1990); Chapman and Wong (1990).

*Estimates are for 1986, 1987, or most current year available; in millions.

†A phased-in ban on tobacco advertising began in January 1989 and is scheduled for completion by January 1993. A court ruling declared the law unconstitutional, but it remains in effect pending appeal (RJR-Macdonald Inc. v. Attorney General of Canada 1990; Imperial Tobacco Limited v. Attorney General of Canada 1990).

among similar products and to build sales or to sustain the price of a particular product (Scherer 1980). Advertising attempts to associate smoking with attributes generally considered positive, such as high-style living, healthful activities, and economic, social, and political success; it fails to voluntarily provide information on the substantial hazards of cigarette consumption. In emphasizing the positive attributes of a product, advertising may increase demand for both a particular brand and a class of products. Much of the debate over tobacco advertising has focused on whether such advertising increases cigarette sales and, consequently, has a negative impact on public health, or whether advertising is strictly a competitive device tobacco companies use to determine relative market share in a stable or declining market, in which case such advertising would have little effect on public health (USDHHS 1989). The results of many analyses of the effects of advertising on cigarette consumption were reviewed in the Surgeon General's 1989 report, which cited the conclusion that it is "more likely than not that advertising and promotional activities do stimulate cigarette consumption" (Warner et al. 1986), although precisely quantifying the influence of these activities on the level of consumption may not be possible.

Evidence from the Canadian advertising ban and the continuing debate over increasing restrictions on advertising in the United States (Koop 1989) and other countries suggest that focus has shifted from the impact of advertising per se to the effects of advertising restrictions on consumption. An extensive study of this issue was performed by the New Zealand Toxic Substances Board (1989) in support of its recommendation for a total ban on tobacco promotion in that country. The relation between tobacco advertising bans and tobacco consumption was examined from 1976 to 1986 in 33 countries. The study demonstrated that "government tobacco advertising bans and controls are accompanied by enhanced rates of fall in tobacco consumption" (page xxiii) and that "the greater a government's degree of control over tobacco advertising and promotion, the greater the annual average fall in tobacco use in adults and young people" (page xxiv). As a follow-up to the New Zealand report, Laugesen and Meads (1990) examined the effects of tobacco advertising restrictions, price, and income on tobacco consumption between 1960 and 1986 in 22 economically developed countries. They found that a total ban on tobacco advertising would have lowered average consumption by 5.4 percent in 1986 in countries without a total ban at that time.

However, these studies have limitations—primarily a failure to account for the potential bias that antitobacco sentiment may be stronger in countries that ban advertising than in countries that do not. Accordingly, restrictions on tobacco advertising are, to some extent, markers of antitobacco sentiment, and a portion of the decline in consumption in countries with bans may be attributable to this sentiment rather than to advertising restrictions. In addition, both studies primarily included developed countries with a high but declining level of tobacco consumption. Extrapolation of these findings to less-developed countries with different patterns of tobacco consumption may be inappropriate.

Supply of Tobacco

Tobacco, which is grown in more than 120 countries, is the most widely grown nonfood crop. It is grown in most developing countries, and the share of tobacco production in developing countries has increased steadily from 50 percent of world production in 1961 to 1963 to 58 percent in 1972 to 1974 to 69 percent in 1987 (Stanley, in press) (also discussed in Chapter 2, "The Emergence of the Tobacco Companies"). In the past decade, most of the increase in worldwide tobacco production has been in China, which accounts for about 34 percent of total world production (Table 8). Major producers in the Americas include the United States (almost 10 percent of

Table 8. Share of world tobacco production, 1990

Country	Production*
Major producers	
China	33.5
United States	9.8
India	7.3
Brazil	6.3
USSR	5.4
Other producers in the Americas	
Canada	1.1
Argentina	1.0
Mexico	0.9
Cuba	0.6
Colombia	0.6
Dominican Republic	0.4
Paraguay	0.3
Venezuela	0.2
Chile	0.1

Source: Food and Agriculture Organization of the United Nations (1990).
*As percentage of world output; computed from weight of crop.

total world production) and Brazil (about 6 percent). Worldwide, about 22 percent of tobacco leaf by weight is grown in the Americas. Tobacco production is increasing more rapidly in developing than in developed countries and is expected to increase in developing countries to more than 72 percent of world production by the year 2000 (Food and Agriculture Organization of the United Nations [FAO] 1990). In the Americas, tobacco production is expected to decline from 23 percent of world production in 1984 to 1986 to 21 percent by the year 2000 (FAO 1990).

Considerable differences exist between the quality and, hence, the price of tobacco leaf produced in different countries. For example, tobacco grown in the Americas is worth almost four times as much as tobacco produced in China, although by weight, the American crop is only 65 percent of the Chinese crop (Agro-economic Services Ltd. and Tabacosmos Ltd. 1987).

Tobacco production is mainly concentrated on small farms in limited geographic areas. The value of the typical tobacco crop frequently makes tobacco an important source of income not only for growers but for local agricultural workers, even though tobacco is often grown in rotation with other crops. Compared with most other crops, tobacco uses little arable land (about 0.3 percent worldwide), but tobacco cultivation is labor intensive (Table 9) (Muller 1978). The tobacco industry's ability to create employment is valued in areas where labor is plentiful and production alternatives are few. Millions of persons are involved in or dependent on some stage of the tobacco-production process for a portion of their livelihood (Agro-economic Services Ltd. and Tabacosmos Ltd. 1987),

Table 9. Labor* and land use in tobacco growing, processing, and manufacturing in the Americas, 1983

Country	Growing		Processing and manufacturing	Distribution		Arable land used (%)
	No.	FTE†	FTE	No.	FTE	
North America						
United States		59.68‡	77.00	228.08	75.80	0.21‡
Canada	66.80	20.40	8.10	31.18	9.58	
Latin America						
Argentina	105.40	43.90	9.73	215.76	7.70	0.20
Bolivia						1.00
Brazil	600.00	288.90	43.87	352.00	120.20	0.50
Costa Rica						0.20
Chile	3.76	1.93	1.95	42.00	2.60	0.10
Colombia	302.00	100.50	9.35	108.00	30.30	0.40
Cuba	20.00	17.00	40.10	23.20	13.40	2.10
Dominican Republic						1.10
Ecuador						0.10
El Salvador						0.50
Guatemala	24.20	6.55	1.48	55.02	0.93	0.40
Haiti	1.23	1.23	0.44	12.20	1.52	0.10
Honduras						0.50
Mexico	351.00	117.00	4.81	197.50	25.90	0.10
Nicaragua						0.20
Panama						0.20
Paraguay						1.70
Peru	10.00	3.50	1.44	22.00	1.90	0.10
Uruguay						0.10
Venezuela	95.00	22.90	3.57	100.00	6.70	0.20
Caribbean						
Jamaica						0.40

Source: Agro-economic Services Ltd. and Tabacosmos Ltd. (1987); Chapman and Wong (1990).
*In thousands of workers.
†FTE = Full-time equivalent.
‡For 1989; U.S. Department of Agriculture unpublished estimates.

and persons in certain regions may substantially depend on tobacco.

Tobacco farming is also highly seasonal. If the work could be spread evenly throughout the year, the average-sized tobacco farm could be managed by one full-time farmer, with some time remaining (Stanley, in press). However, because many workers are needed for harvesting and planting, tobacco farming provides many countries with part-time, seasonal employment for many laborers (Table 9). The average number and full-time equivalent (FTE) number of workers employed in tobacco growing and other aspects of the tobacco industry vary widely in the Americas.

After tobacco is harvested, the crop is processed in various ways before being made into cigarettes and other consumer products. This processing includes sorting and grading, curing and drying, and destemming the raw tobacco leaves. In most countries, these activities occur in agricultural areas and are included in statistics for the agricultural sector. In other countries, some of these activities are associated with the initial stages of the manufacturing process and are included in statistics for that sector.

Many features of the tobacco market make tobacco particularly attractive to growers in many countries. First, and most important, when tobacco is grown extensively, it yields a higher net income per unit of land than most other cash crops and substantially more than most food crops. In addition, price does not fluctuate substantially for tobacco as it does for other cash crops. Moreover, in most countries, tobacco growers protect themselves from the unexpected price fluctuations that plague other crops by negotiating sales prices for crops before planting; growers are paid in cash immediately upon sale (Economist Intelligence Unit 1983). The combination of prenegotiated price and quick sale makes tobacco growing easy to finance. The extremely favorable conditions of sale offered to tobacco farmers are not usually offered to growers of other crops. Various combinations of government and transnational tobacco company activities, including controls on planting, production quotas (guaranteed prices, incentives, and subsidies), import duties, state tobacco monopolies, state trading in tobacco, foreign aid programs, and limitations on marketing, benefit tobacco growers in many countries. As a result, much of the risk of tobacco growing is shifted from the farmer to the purchaser.

Although tobacco provides most farmers with higher gross returns per hectare than many other crops do, considerable costs are associated with tobacco growing. In addition to being labor intensive, tobacco cultivation requires large amounts of fertilizers and pesticides, and in many areas, fuel (wood, gas, or oil) is needed for tobacco curing. The U.S. Department of Agriculture (USDA) estimated that, excluding land and quota cost, the cost of growing flue-cured tobacco in the United States in 1990 amounted to 70 percent of the value of the crop produced (Clauson and Grise 1990). In examining the opportunity costs of tobacco growing in Brazil in terms of alternative crops, Barrows (unpublished) found that the value that labor employed in tobacco growing would have in alternative activities is the most important factor in determining the profitability of tobacco. Barrows estimated that in 1986 in Rio Grande do Sul, total returns to land, labor, and management for tobacco were 130 percent of those for manioc and 118 percent for potatoes. However, cultivation of tobacco required 7.5 times as many man-hours of labor as manioc did and 5.3 times as many man-hours as potatoes did. Accordingly, all of the apparent additional returns to the tobacco grower were in fact returns to the additional labor invested, and the actual profitability and net social benefit of the tobacco crop depended on the wage rate and the potential alternative uses of the labor employed in tobacco growing.

Manufacturing

Most of the tobacco grown worldwide is flue-cured and processed on the farms. Tobacco is then manufactured into cigarettes, cigars, smokeless tobacco products, and loosely cut smoking tobacco. About 85 percent of worldwide tobacco production is used for cigarettes. Flue-cured tobacco accounts for almost 60 percent of the tobacco in American-style cigarettes and all of the tobacco in British-style cigarettes.

The manufacturing of cigarettes provides substantial employment in many countries, but the labor intensity of cigarette manufacturing varies considerably by country. In the United States, production is highly automated; seven factories produce enough cigarettes for the domestic market and for the large and growing export market. In Latin America, cigarette manufacturing is less automated and more labor intensive (Table 9). Cigar manufacturing is more labor intensive than cigarette manufacturing, which is reflected in the employment figures for countries that are important producers of cigars (e.g., Cuba and the Dominican Republic).

Distribution

Tobacco is distributed in many forms. Cigarettes are sold in cartons of 10 packs and in packs of 10, 15, 20, and 25 cigarettes. In many areas, street vendors

sell cigarettes individually from broken packs. In some countries, cigarettes are sold by tobacconists; however, cigarettes and other tobacco products are typically sold by retail merchants who also sell a variety of other consumer goods. Accordingly, in most countries, total employment in tobacco distribution is many times FTE employment because tobacco sales represent a small part of the employees' jobs (Table 9).

Distribution in the tobacco sector is a small component of larger distribution activities in most economies. Although attributing some proportion of employment to tobacco distribution activities is statistically appropriate, such attribution may be inappropriate for analytic reasons. In the absence of tobacco products, consumers would purchase alternative goods, and the production of these goods would result in employment—not only in the distribution sector but in the manufacturing and farming sectors as well. Although the level and type of employment generated by alternative consumption patterns may change with changes in the tobacco sector, total employment would not change significantly. Some persons, however, may be affected by shifts in consumption patterns; some persons may become unemployed, and some may change jobs or job activities.

The tobacco industry also creates output in other parts of the economy—both directly, by creating demand for products such as fertilizers, fuel, and paper used in the manufacture of tobacco products, and indirectly, when persons employed in the industry spend their earnings for their own consumption. Every economic activity, however, has both direct and indirect links to other economic activities. The exact nature of the links differs among industries and countries, but the net aggregate effect of shifts in demand into or out of specific industries is small, except perhaps for some transitional costs. Exceptions may occur, however, for factors that receive higher-than-normal returns (called "rents" by economists) from a specific activity. Such factors are particularly disadvantaged by a reduction in rent-producing activity; however, even their losses are balanced by gains to other factors of production or to consumers.

Trade

Most tobacco is consumed within the country of production; only 25 percent of world production is traded internationally, primarily as a raw commodity. Only the United States, the United Kingdom, and the Netherlands are important exporters of cigarettes, and the United States is the leading cigarette exporter—at 25 percent of the worldwide total. In addition, the United States exports much high-quality tobacco, which in several countries, is blended with tobacco from other sources to make the increasingly popular American-style cigarettes. The United States imports oriental tobacco and other less-expensive filler tobacco to blend with U.S.-produced tobacco to make cigarettes for domestic consumption and export. Brazil, another major tobacco exporter sells much of its crop in Europe. On the whole, countries in the Americas have a substantial balance-of-trade surplus in tobacco (Table 10).

Subsidies to Tobacco Production

Subsidization may be used in an attempt to develop or protect a domestic tobacco industry or to control the importation of cigarettes or tobacco to conserve foreign exchange. The growing and curing of tobacco is frequently controlled and directed by the main tobacco purchasers—either large, private companies or government agencies. In many areas, these organizations set the price of tobacco before planting and provide seeds or seedlings to tobacco farmers, who are thus guaranteed a minimum income for their crop at harvest time. These production controls are primarily designed to encourage the production of a limited amount of high-quality, marketable tobacco (Lewit 1988).

The situation in southern Brazil exemplifies an industry-sponsored support program for tobacco growers that has fostered the development of a tobacco-growing sector. The cigarette manufacturers provide the growers with all purchasable inputs—including seed, pesticides, and fertilizers—at wholesale prices, and maintain agricultural extension programs to develop tobacco plants and technology appropriate for the area. Farmers are visited regularly by technical advisers provided by the tobacco companies. The purchasers also control the chemicals used in growing tobacco so that the crop will conform to U.S. and European standards and be exportable (about 37 percent of the Brazilian crop is exported) (Economist Intelligence Unit 1983). The value of the extension services rendered to farmers is estimated at 30 to 35 percent of the prices paid to farmers for the tobacco (Economist Intelligence Unit 1983).

A similar relationship exists in Venezuela among the government, two tobacco processors, and several hundred tobacco farmers. The farmers receive financial and technical aid from the companies, along with guaranteed prices for crops. As a result, the companies have some control over the quality and quantity of the tobacco crop, but the companies can also set retail cigarette prices. The Venezuelan government

Table 10. International trade in tobacco, 1984 and 1985*

Country	Imports		Exports		Trade balance
	Total value	Percentage of all imports	Total value	Percentage of all exports	
North America					
Canada†	51,066	0.1	97,579	0.1	+46,513
United States†	734,082	0.3	2,658,053	1.3	+1,923,971
Subtotal	785,148		2,755,632		+1,970,484
Latin America					
Argentina	1,210	<0.1	46,310	0.6	+45,100
Brazil	140	<0.1	468,570	1.7	+468,170
Chile	800	<0.1	4,200	0.1	+3,400
Colombia	9,681	0.2	22,243	0.6	+12,562
Costa Rica	312	<0.1	521	<0.1	+209
Cuba	375	<0.1	64,866	1.0	+64,491
Dominican Republic	1,687	0.1	30,872	3.5	+29,185
Ecuador	1,900	0.1	993	<0.1	-907
El Salvador	1,041	0.1	510	<0.1	-531
Guatemala	1,000	<0.1	16,099	1.4	+16,753
Haiti	4,100	0.9	—	—	-4,100
Honduras	3,170	0.3	15,562	2.1	+12,392
Mexico	6,290	<0.1	30,420	1.3	+24,130
Nicaragua	137	<0.1	4,222	1.1	+4,085
Panama	1,458	0.1	1,873	0.7	+415
Paraguay	8,964	1.7	14,653	4.4	+5,689
Peru	3,173	0.1	292	<0.1	-2,881
Uruguay	4,842	0.6	1,136	0.1	-3,706
Venezuela	1,140	<0.1	14,380	0.1	+13,240
Subtotal	51,420		737,722		+686,302
Caribbean					
Guyana	695	0.1	—	—	-695
Jamaica	4,868	0.4	14,750	1.9	+9,882
Trinidad and Tobago	6,723	0.4	318	<0.1	-6,405
Subtotal	12,286		15,068		+2,782
Total	848,854		3,508,422		+2,659,568

Source: Agro-economic Services Ltd. and Tabacosmos Ltd. (1987); Chapman and Wong (1990).
*Unmanufactured tobacco only; in U.S. dollars.
†1983 data.

provides tobacco farmers with subsidized inputs and low-interest loans but receives a steady stream of tax revenues from a 50 percent tax on retail cigarette sales (*Tobacco International* 1989).

Canadian tobacco manufacturers offer subsidies to Canadian tobacco growers, which allow growers to competitively price Canadian leaf for export (Collishaw, Kaiserman, Rogers 1990). But in a unique turn of events, the Canadian government developed a subsidy program to downsize the Canadian tobacco industry (Collishaw, Kaiserman, Rogers 1990).

In Argentina, a levy on cigarette sales is used to finance a fund to support tobacco prices, but the fund is fairly static. Support prices have tended to fall as output increased, which has resulted in inadequate incentives to sufficiently increase crop quality for an export market (FAO 1990).

In other countries, such as the United States, tobacco production is encouraged by the establishment or support of high prices and the institution of production controls to avoid excess supplies. Since 1933, USDA has operated a tobacco price-support

program to increase the returns to tobacco cultivation (Warner 1988; Congressional Research Service 1989). Although the program was revised substantially in 1986, it still controls supply to reduce U.S. production and supports higher-than-free-market prices of U.S. tobacco for both domestic and foreign consumption. The current program also restricts the location of tobacco farms in the United States (Grise 1988), which probably makes U.S. tobacco production more costly than it might otherwise be.

Subsidization may introduce distortions into the tobacco market. By making tobacco growing more profitable to the farmer than it would be if prices were determined solely by market forces, subsidization encourages a shift of resources from other crops to tobacco. In competitive markets, such a resource shift would lead to an expansion in supply and an equilibrating fall in price. When supply is controlled and unable to expand, price does not fall, and farmers earn excess profits for their production. Many developing countries also attempt to discourage importation of foreign tobacco (either in raw form or as cigarettes) by setting bans, quotas, or high tariffs. Consequently, prices received by tobacco growers in these countries are likely to be above free-market prices; domestic production becomes stimulated; and tobacco farmers' incomes increase.

Excess profits, or rents, encourage producers to organize politically to protect themselves against increases in supply, falling prices, and government campaigns designed to discourage smoking. Such rent-seeking behavior has been observed in markets for many products around the world (Tollison 1982) and should be considered a consequence of most regulatory and subsidy policies. Furthermore, the net effect of programs that limit tobacco importation or production is beneficial to domestic producers but at the expense of consumers. These programs do not confer a net benefit on the country as a whole and only transfer income between groups. However, because such measures usually increase cigarette prices and may decrease cigarette quality, consumption may be reduced. But high tariffs and import restrictions can encourage the growth of an illegal market in smuggled cigarettes.

Although no official trade statistics estimate the size of the world market in illegally traded tobacco products, these statistics indicate that from 1984 through 1986, exports were 13 percent greater than imports (FAO 1990) (see also Chapter 2, "The Emergence of the Tobacco Companies"). Cigarettes smuggled from the United States have been a problem in several Latin American countries over the years, most recently in Colombia (Nares 1984). Cigarette smuggling also appears to be a problem in Uruguay and Paraguay, and the growing disparity in cigarette taxes between the United States and Canada has increased the incidence of border crossings to purchase cigarettes in conveniently located duty-free shops in the United States (USDA 1990). Illegal reimportation of Canadian cigarettes is also becoming increasingly common. Canadian cigarettes smuggled back into Canada from the United States accounted for an estimated 1 to 4 percent of total Canadian cigarette consumption in 1990 (Collishaw, personal communication 1991).

The United States is the world's second largest tobacco producer (after China) and the largest exporter of tobacco. U.S. tobacco exports accounted for 18 percent of all nonmanufactured tobacco traded internationally in 1984 to 1986, down substantially from the 35 percent market share held in 1955 to 1959 (FAO 1990). Spillover effects of the U.S. tobacco price-support program affect the development of tobacco-growing sectors in many developing countries. Higher-than-free-market prices, received by U.S. tobacco growers as a result of the U.S. tobacco program, benefit the growers and entitlement holders (those with permits to grow tobacco) at the expense of domestic and foreign consumers. These high prices also create opportunities for foreign producers to profitably produce tobacco for both domestic consumption and export (sometimes to the United States). U.S. tobacco, although very expensive, is perceived to be of high quality. Accordingly, a substantial fall in the price of U.S. tobacco could have a significant impact on the world market.

Sumner and Alston (1984) have estimated that elimination of the U.S. tobacco-support program would very conservatively result in a 50 percent increase in U.S. tobacco production and a 25 percent reduction in the price of U.S. tobacco. Very little of this increased production would be absorbed in the United States or abroad through increased consumption of cigarettes. Some of the tobacco (27 percent) would substitute for that currently imported by the United States, but most (73 percent) would be exported (Sumner and Alston 1984). The excess U.S. tobacco would be highly competitive with tobacco produced in other countries, and as a result, tobacco growing would become much less profitable in other countries. In fact, an increase in U.S. tobacco exported or substituted for imports could be devastating to developing countries that depend on tobacco export earnings for foreign exchange. Tobacco exported by developing countries amounts to over one-third of the current export market (Lewit 1988).

The various subsidies provided to many tobacco producers make the evaluation of tobacco-production policies complex, and each case should be examined individually to determine the true "benefits" of tobacco production. The vulnerability of tobacco exportation and prices to changes in U.S. farm policy is difficult to value, but tobacco-development projects should be evaluated in terms of potential changes to this policy. Tobacco production is profitable in many countries primarily because it allows participation in a subsidized market established by USDA. Thus, the subsidization of U.S. producers has created an opportunity for subsidization in other tobacco-producing countries as well.

Contribution of Tobacco to Economic Growth and Development

Tobacco production can contribute to economic growth and development directly by raising national income and investment and indirectly through various spillover effects. Heavily subsidized tobacco production enables transfer of resources from tobacco consumers to producers. When producers are concentrated in developing countries and consumers are concentrated in the developed world, this transfer tends to raise incomes and stimulate growth and investment in the developing countries. For example, Brazil, the second largest tobacco exporter in the world (after the United States), accounted for more than 14 percent of all tobacco exported in 1989. Most of Brazil's tobacco exports are sent to the United States and Western Europe (USDA 1985). Brazil obtains an above-market price for tobacco exports, due to subsidy programs in other countries, and profits from this exportation.

Because tobacco is readily marketable, investments in agricultural projects supporting tobacco production are usually self-liquidating, and in the past, such investments may have been thought attractive by international development agencies, which financed projects designed to enhance tobacco production in Latin America and the Caribbean (Chapman and Wong 1990). Such financing is currently under review by some international lenders because of concerns about the long-term health effects of encouraging tobacco-industry growth in developing countries.

Externalities

Several positive externalities, or technologic spillover effects, have been associated with both tobacco growing and manufacturing. Improvements in farming practices, for example, have increased yield from not only tobacco but other crops as well because many of the modern farming procedures introduced for tobacco growing can also be applied to other crops grown in rotation with tobacco (Sofranko, Fliegel, Sharma 1976; Economist Intelligence Unit 1983). Producing a tradable tobacco crop requires a high degree of quality control, and in many countries, tobacco purchasers provide the technical support and inputs necessary for a high-quality crop. Furthermore, manufacturing and marketing of tobacco products may require highly trained workers to maintain and support modern factories in developing countries (Philip Morris International Inc. 1988). The training, except for that specific to tobacco production, helps to increase the supply of sophisticated managers and technicians. These positive externalities, however, could probably be achieved for many other commodities as well.

One potentially negative externality is deforestation associated with curing tobacco. Several early reports indicate that curing with wood requires felling one tree per 300 cigarettes (Muller 1978). Stated in other terms, one hectare of woodland is required to cure either one hectare (Eckhold et al. 1984) or one-half hectare (International Agricultural Development 1984) of tobacco. The latter source also estimates that one in 12 trees cut worldwide is used for curing tobacco. These estimates correspond to a specific fuel consumption (SFC) of between 100 and 230 kg of wood per 1 kg of tobacco.

The only multicountry analysis of deforestation associated with the curing of tobacco was commissioned by the International Tobacco Information Centre (an industry-sponsored group) and was performed by the International Forest Science Consultancy (Fraser 1986). For the few countries examined, the researchers estimated that the SFC for individual farms ranged from 2.5 to 40 kg/kg (average of 7.8 kg/kg) and that the SFC for Brazil was 15 to 20 kg/kg. Overall, the report estimated that in tobacco-growing, developing countries, only 0.7 percent of trees cut for all purposes are cut for tobacco curing. Because no available data question these findings, deforestation associated with tobacco curing cannot currently be considered a significant negative externality, although deforestation in general is a major concern in many parts of Latin America.

Price, Production, and Substitution

A decline in the price of tobacco, which would discourage production, would occur if demand for tobacco were significantly reduced or if the subsidies and tariffs that support tobacco production were

reduced. Worldwide, a significant excess supply of tobacco would result if production controls were relaxed (FAO 1990). The substantial price reduction that would probably result from this excess supply would make tobacco growing less profitable than it currently is.

As described earlier, tobacco produced for export allows a country to participate in a subsidized international market and capture some of the economic transfers between consumers and producers that occur in such markets. Such participation may benefit a country's net income, provided that no serious externalities are associated with tobacco production. When tobacco is produced for domestic consumption, however, most subsidies enjoyed by domestic producers are financed by domestic consumers, and domestically financed subsidies are likely to encourage rent-seeking behavior. Such behavior may in turn lead to increased efforts to protect the domestic market from foreign competition. It may also result in attempts to encourage tobacco consumption and restrain policies designed to discourage consumption for health reasons. However, the higher prices that result from controls on supply may alone reduce consumption.

Tobacco production has also been encouraged to allow substitution for imported tobacco. Economic development through import substitution was a popular economic policy in South America in the 1950s (Fishlow 1990). For the tobacco sector, this policy may appear attractive in the short term because import substitution saves on foreign exchange, creates employment, and shifts the subsidy paid by consumers from foreign suppliers to domestic producers. The development of a domestic tobacco sector almost certainly results in increased tobacco use because of a decline in tobacco's real price. In addition, development of a domestic sector makes it more difficult for a country to mount successful antitobacco campaigns because domestic producers rather than foreign suppliers are affected. Because of these conflicting interests, the measurement of the net costs or benefits associated with developing a domestic sector is difficult and must reflect the idiosyncrasies of each country.

Increased support for the production of crops other than tobacco might effectively control tobacco production (Warner et al. 1986). For example, some farmers in the tobacco-growing area of southern Brazil choose not to grow tobacco because of the large labor input required (Economist Intelligence Unit 1983), which suggests that tobacco may be only marginally advantageous for many growers in that area. But a policy of support for other products must be carefully considered for each country. In some areas, alternatives to tobacco growing are feasible. For example, vegetables (such as tomatoes) have been suggested as alternatives in North Carolina. However, because of soil and climatic conditions, the cultivation of other crops in other areas may not be economically viable.

Market response to attempts to substitute other crops for tobacco may complicate this policy. Increased production of alternative crops may lead to a fall in their prices, which not only makes them less-attractive substitutes for tobacco, but also harms traditional producers of these crops. Similarly, a decline in tobacco production by established producers may merely produce opportunities for competitors to initiate or increase production. Given the potential excess supply of tobacco in many countries, programs that encourage production of alternative crops will probably require strict controls to successfully reduce tobacco production. The main attraction of such policies may be that they provide a politically acceptable way to "buy off" tobacco growers. By offering growers an acceptable, profitable alternative to tobacco, policies designed to reduce the demand for tobacco may be easier to implement.

In 1987, Canada instituted a C$30 million tobacco diversification plan, and by 1990, about C$80 million had been allocated to the plan. One component of the plan, the Alternative Enterprise Initiative Program, focuses on the development of alternative crops and production technologies to benefit tobacco-growing regions (predominantly Ontario). A second part of the program offers cash incentives to encourage tobacco farmers to retire from the industry (USDA 1987a,b). The Canadian government has only recently begun to evaluate this program; anecdotal evidence suggests, however, that most retired Canadian tobacco growers have found alternative employment and that the local economy in the tobacco-growing area of Ontario is flourishing (*Delhi News-Record* 1990). This trend in Canada is consistent with trends in the United States where, even without a program designed to underwrite downsizing, tobacco agricultural employment declined by 20 percent between 1977 and 1985 (U.S. Bureau of the Census 1988). From 1979 to 1989, U.S. tobacco acreage declined by 16 percent, but because of an increase in yield per acre, production fell by only 4 percent. To some extent, the shifts in U.S. tobacco production during the 1980s reflected changes in the USDA crop-support program, which reduced prices to make U.S. tobacco more competitive in international markets and bring supply and demand into better balance.